

Reg. No.

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**B.E./B.TECH. DEGREE EXAMINATIONS, MAY 2024**

First Semester

**PH22153 – TECHNICAL PHYSICS***(Common to BT & CH)***(Regulation 2022)****TIME: 3 HOURS****MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Apply fundamentals law of optics in different types of LASER and Optic fiber communication	3
CO 2	Apply the principals of Quantum mechanics to study the properties of electrons	3
CO 3	Classify and demonstrate the fundamentals of crystals and their defects in solids	2
CO 4	Explain different types of New Engineering Materials used in Various applications	2
CO 5	Demonstrate the production and propagation of Acoustical waves	2

**PART- A (20 x 2 = 40 Marks)***(Answer all Questions)*

	CO	RBT LEVEL
1. Mention the four characteristics of a laser beam	1	2
2. A silica optical fiber has a core refractive index of 1.51 and a cladding refractive index of 1.48. Determine Numerical aperture and acceptance angle of an optical fiber	1	3
3. Differentiate spontaneous emission and stimulated emission.	1	2
4. Give any two medical applications of fibre optic endoscopy	1	2
5. Write the expression for Compton shift. Why it is not observable in the visible region of the electromagnetic spectrum?	2	2
6. An electron is accelerated through a potential difference of 54 V. Calculate the de-Broglie wavelength associated with the electron.	2	3
7. Give the condition for normalization of the wave function.	2	2
8. Write the physical significance of the wave function	2	2
9. Name the seven crystal systems.	3	2
10. For a cubic system, sketch the planes with Miller Indices (100) and (111).	3	2

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|--|---|---|
| 11. Calculate the interplanar spacing for the (101) plane in a simple cubic lattice whose lattice constant is 4.2 Å.   | 3 | 2 |
| 12. Differentiate primitive and non-primitive cells.   | 3 | 2 |
| 13. What will happen when we decrease the size of the particle to nano size?   | 4 | 2 |
| 14. What are the advantages of using metallic glasses as transformer core materials?   | 4 | 2 |
| 15. What causes the SMA's to remember their Shape?   | 4 | 2 |
| 16. How are biomaterials classified?   | 4 | 2 |
| 17. State relation between loudness and intensity  | 5 | 2 |
| 18. A cinema theatre has a volume of 8500 m <sup>3</sup> . What should be the total absorption in the theatre, if the reverberation time of 1.6 seconds is to be maintained? | 5 | 2 |
| 19. Which method is suitable for producing high frequency Ultrasonic waves?  | 5 | 2 |
| 20. If the reverberation time is higher than the critical value, how will it affect the acoustical quality of a building?  | 5 | 2 |

**PART- B (5 x 10 = 50 Marks)**

- |   | Marks | CO | RBT<br>LEVEL |
|---|-------|----|--------------|
| 21. (a) With the help of an energy diagram, illustrate the construction and working of a four-level solid-state laser, where the Nd <sup>3+</sup> ions act as the active centers. | (10)  | 1  | 3            |
| <b>(OR)</b>   |       |    |              |
| (b) Deduce an expression for the numerical aperture and acceptance angle of fiber in terms of the refractive index of the core and cladding.                                      | (10)  | 1  | 3            |
| 22. (a) Derive an expression for the change in wavelength of an X-ray photon when it collides with an electron  | (10)  | 2  | 3            |
| <b>(OR)</b>   |       |    |              |
| (b) Derive an expression for Schrodinger's time-independent wave equation   | (10)  | 2  | 3            |
| 23. (a) Explain the No. of atoms, atomic radius, Co-ordination number and packing factor for SC and BCC structures.   | (10)  | 3  | 2            |
| <b>(OR)</b>   |       |    |              |
| (b) Obtain the relation between Miller indices and inter-planar spacing of a cubic structure.   | (10)  | 3  | 2            |

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|----------------|--|-------------|----------|----------|
| <b>24. (a)</b> | Give a detailed account of metallic glasses their method of production, types, properties and application                              | <b>(10)</b> | <b>4</b> | <b>2</b> |
| <b>(OR)</b>    |  |             |          |          |
| <b>(b)</b>     | Describe the chemical vapour deposition technique to synthesis nanomaterials.  | <b>(10)</b> | <b>4</b> | <b>2</b> |
| <b>25. (a)</b> | Explain the factors which affects the good speech intelligibility in a building and its remedies                                       | <b>(10)</b> | <b>5</b> | <b>2</b> |
| <b>(OR)</b>    |  |             |          |          |
| <b>(b)</b>     | Define piezo electric effect and explain how it can be applied for the production of ultrasonic waves using Piezo electric oscillator. | <b>(10)</b> | <b>5</b> | <b>2</b> |

**PART- C (1 x 10 = 10 Marks)**

(Q.No.26 is compulsory)

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|------------|--|------------|----------|--------------|
| <b>26.</b> | <b>(i)</b> Derive an expression for absorption co-efficient using Sabine's reverberation time.   | <b>(6)</b> | <b>5</b> | <b>2</b>     |
|            | <b>(ii)</b> A hall has a Volume of 1200 m <sup>3</sup> . Its total absorption is equivalent to 480m <sup>2</sup> of open window. What will be the effect on the reverberation time if audience fills the hall and thereby increases the absorption by another 480 m <sup>3</sup> of open window. | <b>(4)</b> | <b>5</b> | <b>2</b>     |

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